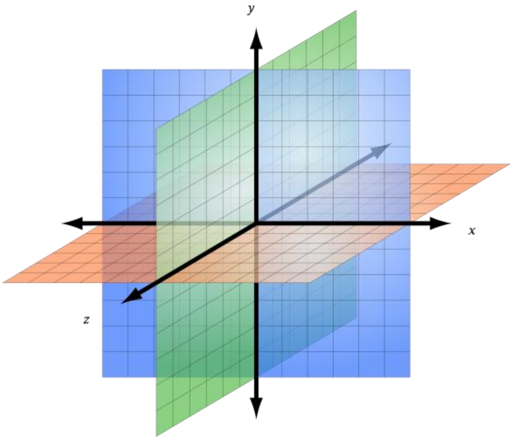
On the three-dimensionality of space



Line is one-dimensional, plane is two-dimensional, space is three-dimensional. These are axioms.

This implies that to specify the position of a point on the plane, two coordinates (two numbers) are required, and in space - three one's. In other words, you must be told of three numbers so that you can find the desired point in space.

In fact, just for our convenience, we have taken two coordinates on the plane and three in space. We are used to operating in terms of length, width and height. Although, in everyday life, we unconsciously use polar coordinates, determining the position of, say, an airplane in the sky: “Over there, a kilometer from here,” and we indicate the direction to it (angle).

Already in this example, we have managed with two coordinates, combining two angles φ, θ into one spherical angle - “over there”. The following will show you how to set this angle.

And now, let us show that both for the plane and for space, only one coordinate, one number is enough.

The coordinate line in Fig. 1 is an Archimedes spiral with beads tightly strung on it, which, in fact, are the coordinates.

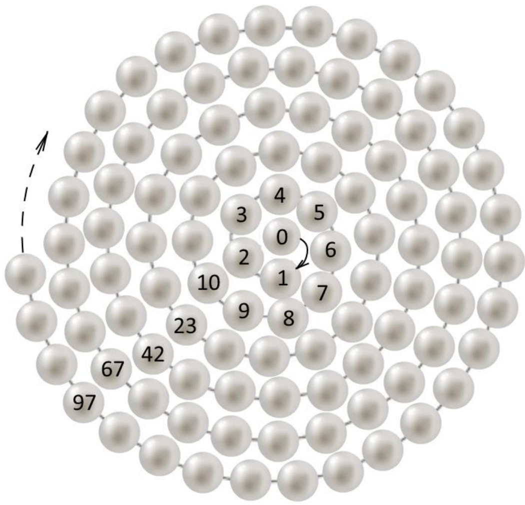


Fig.1

In the process of unfolding from point O, the spiral runs through all points of the plane, and therefore the moment when it reaches the desired point is the coordinate of this point (1,2,….97).
And here is another, polar interpretation of this coordinate system (Fig. 2). This figure shows the same coordinate line, only, unlike Fig. 1, the coordinate here is set not by the length of the spiral thread, but by the number of its revolutions around the zero coordinate.

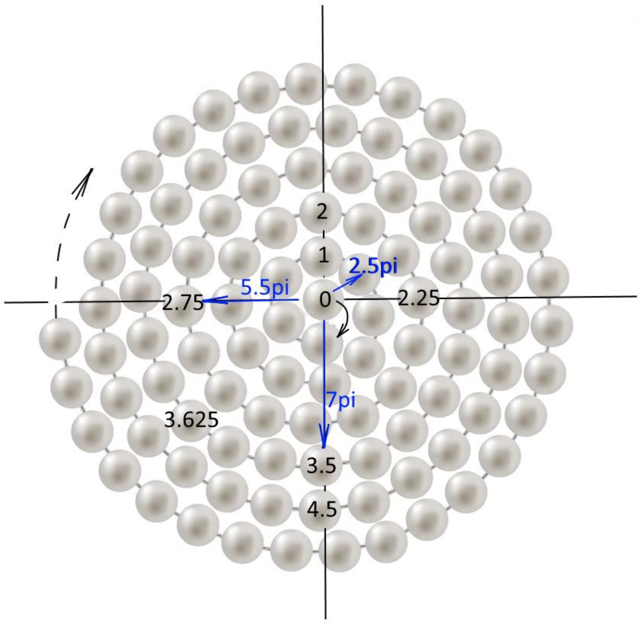


Fig.2

So, for example, the coordinate "2" means that the desired point is located on two traversed circles of the spiral, and "3.5" - at three and a half revolutions around point 0.

Instead of the number of revolutions, the coordinate of the points can be specified by the angle of the complete revolution of the spiral. For example, in Fig. 2, the coordinate of the point **2.5π** is shown in blue. This is the angle described by the spiral from point **0** to this point.

The numerical coordinate 3.5 corresponds to the angular coordinate**7π**. It is clear that they are related by a simple formula: $3.5 \times 2\pi = 7\pi$.

The same system is used to set a one-dimensional coordinate in space. Only the coordinate spiral will unfold not along the plane, but along the surface of the sphere, like a thread along a clew.

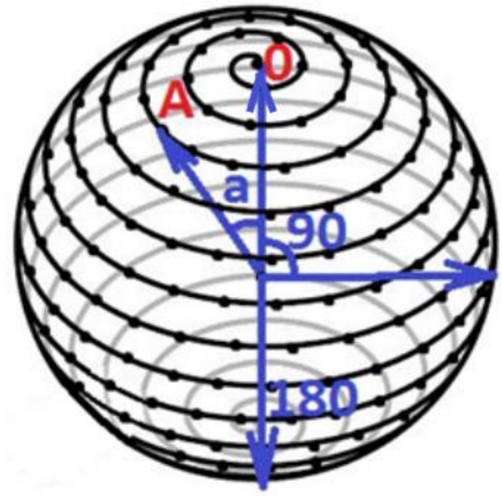


Fig.3

In this spherical coordinate system, the spiral unfolds along the sphere, passing successively from top to bottom all points of its surface. Having reached the lower end of the sphere, it begins its reverse scanning from bottom to top, but already in the next layer. And just as in the flat spiral in Fig. 2, the coordinate can be set by the growing angle α between the radius vector from the center of the sphere at point **0** and the radius vector directed to the desired point **A**.

This coordinate angle for the first layer of the sphere is equal to zero at point **0**, then gradually increases to 90 degrees at the "equator" of the sphere and reaches 180 degrees at the lowest point of the coordinate sphere. Then, moving upwards along the new layer, at the equator its value will be equal to 270 degrees, and at the top point (above the original point **0**) - 360 degrees. Etc.

So, our world may well be described by just one coordinate! This is not at all familiar, probably inconvenient, but the point is not in convenience, but in the fact that there is no multidimensionality of space: it is one-dimensional!